

CROCODILUS JOHNSONI KREFFT.

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(Plates XXIII-XXIV.)

ALTHOUGH described by Krefft so long ago as 1873, but little attention has been given to the Long-snouted or Freshwater Crocodile, *Crocodylus johnsoni*. In his valuable studies of skull characters of recent Crocodylia, C. C. Mook was able to give only a brief description, owing to absence of material. The following notes are mainly based on cranial material, but some other characters have been outlined and may be of value to systematists. A paper of this kind might be expanded into an elaborate monograph, but only such cranial and other characters as appear to be of special interest have been dealt with.

The following are references to literature:—

Crocodylus johnsoni, Krefft, Proc. Zool. Soc., 1873, p. 334-5.

Philas johnstoni, Gray, Proc. Zool. Soc., 1874, p. 177-8, Pl. 27.

Crocodylus johnstoni, Boulenger, Brit. Mus. Cat. Chel., Rhynch & Croc., 1889, p. 279 (Port Darwin); F. Hann, Pr. Roy. Soc., Qld., xvi., 1901, p. 21 (Phillips River, West Australia); Ogilby, Pr. Roy. Soc., Qld., xviii., 1904, p. 201; xix., 1907, p. 4; Basedow, Pr. Roy. Geograph. Soc. Aus. (S.A. Br.) xviii., 1918, p. 226 (Forest River, North-West Australia); Lucas & Le Souef, Animals of Australia, 1909, p. 189, photograph from life by A. E. H. Mattingley; C. C. Mook, Bull. Amer. Mus. Nat. Hist., xlv., 1921, p. 173.

It will be noted that Krefft first described this crocodile specifically as *johnsoni*, but subsequently altered the spelling to *johnstoni*, as it was found by "Mr. Johnston, of Cardwell," Queensland.*

* The late Sub-Inspector Robert Arthur Johnstone, of the Queensland Police, contributed to the Brisbane Press the following account of his discovery, for which I am indebted to Mr. Edgar Young, son-in-law, who is Honorary Collector to the Queensland Museum:—

"The Herbert is the only eastern water in Australia in which is found the *Crocodylus johnstonii*, so named after the writer, who sent the first named specimen down which he shot in the Herbert, near the mounted police camp, at Cashmere, on the Upper Herbert. When I shot it I thought it was a freak, and not a distinct species, but sufficiently peculiar to forward as a Museum specimen; but after shooting many specimens all possessing the same peculiarities, I was satisfied it was a new species, being much smaller and perfectly harmless, as was proved by the fact of the piccaninnies, puppies, and all hands constantly "bogeying" in the same reach of the river where the crocodiles were seen daily. Of all the numbers I shot I carefully opened them to examine the state of the larder, and never found anything larger than a water rat in it, with some lobster shells, stones, and moss, in each case the largest quantity being stone pebbles, to help digestion, I presume. The skin and flesh have a very strong smell of musk; in fact, after opening one it is impossible to get rid of the smell of musk for days, no matter how one tries. They are only found above the Herbert Falls, and the *C. porosus* below the falls. . . . *C. johnstonii* is harmless, and makes a nest of leaves, grass, and sand, forming a mound in which the eggs are buried."

Material.—The specimens in the Queensland Museum are—

- J. 4279.* A juvenile, 295 mm., in spirits. Wickham River, off Victoria River, Northern Territory, Mrs. T. Graham.
J. 4283. A mounted specimen, juvenile, 740 mm. Locality doubtful.
J. 4278. A mounted specimen, 2,273 mm. Burketown, F. H. Hann.
J. 2788. Skin and skull, 2,343 mm. Hulbert's Hole, Flinders River, 35 miles below Richmond, N.W. Qld., F. L. Berney.
J. 4277. Skin and skull, smaller than above, damaged; same locality.

There are also four isolated crania, the largest (*J. 4286*) being 398 mm. from the anterior end of snout to the supra-occipital, and the smallest 262 mm.

The skin and skull sent in by Mr. F. L. Berney, from the Flinders River, 7 ft. $8\frac{1}{4}$ in. or 2,343 mm. in length, appears to be the record for the species (length of skull, snout to supra-occipital 375), but as the aged skull (*J. 4286*) is considerably larger it is obvious that this freshwater Crocodile reaches about 8 ft.

Chief Cranial Characters.—Skull small, with elongated snout. Cranial table flattened. Premaxillæ but little expanded; bony nasal septum absent; no very dominant notches. Anterior portion of nasals sometimes hidden beneath premaxillaries. Dentition: Upper jaw 19 to 21; lower jaw 15 to 17, with occasional presence of double functioning teeth. Frontal-parietal suture anterior to supratemporal fenestræ; maxillo-palatine sutures extending far anterior to palatine fenestræ. Quadrato-jugals with anterior fenestral processes. Mandibular symphysis ends between 6th and 7th teeth; splenial extending forward nearly to symphysis.

Superior Surface.—In general contours the skull resembles that of *Crocodylus cataphractus*, which in turn approaches that of *Tomistoma schlegeli*. The distance from the anterior border of the orbits to the tip of the snout is more than twice the breadth at the termination of the dental arcade in old specimens, and nearly three times this breadth in immature specimens.

Premaxillaries.—These are much longer than broad, and have prolonged posterior processes near the median line which may extend as far back as the third maxillary teeth, and which separate the nasals from the maxillæ in this region. The maximum length apart from the processes is at least twice the breadth at the notches. Except in the largest cranium these bones are not greatly expanded laterally beyond the line of the maxillaries. There are three lateral notches for the accommodation of the second, third, and fourth mandibular teeth on each side, the latter being the largest. The external narial aperture is somewhat variable in shape in the four specimens examined, being oval in the smaller and almost circular in the largest cranium. It is slightly smaller than a supratemporal fenestra. The anterior border is relatively smooth. The premaxillo-maxillary suture passes obliquely and irregularly backward to the attenuated processes, from whence it passes back at a very acute angle to the end of the bone and then returns forward, also very acutely, beside the nasal to meet its fellow on the median line. This suture is not completely shown on Plate XXIII.

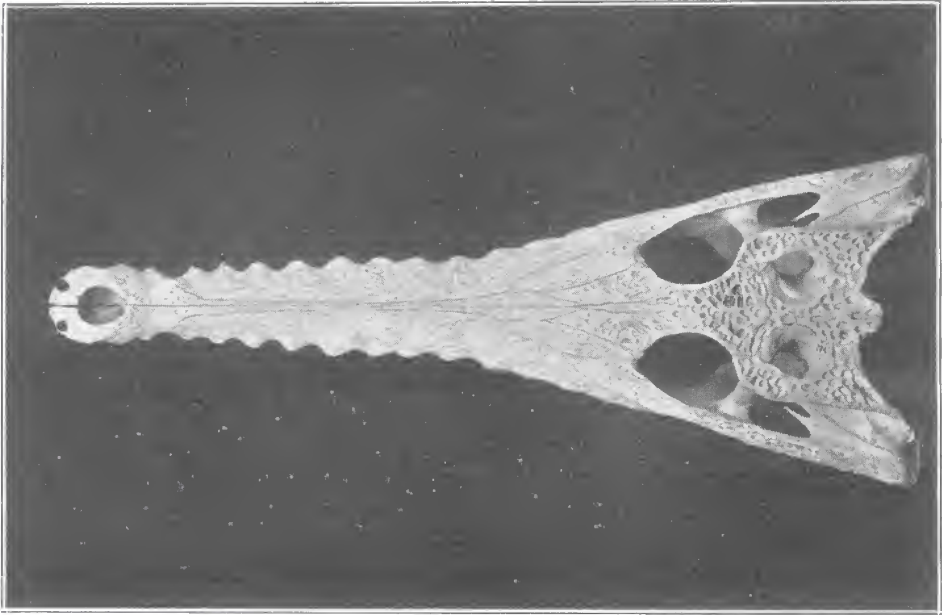


Fig. 1.—*Crocodilus johnsoni*. Superior surface of cranium. J. 4280.
Length 266 mm.



Fig. 2.—*Crocodilus johnsoni*. Lateral view of cranium. J. 4280.



Maxillaries.—These elongated bones form by far the greater portion of the preorbital region, and owing to the narrowness of the nasals their superior borders come very close to each other. Boulenger's statement that the maxillaries form a median suture above, behind the nasal opening, is incorrect for our specimens, and Mook interprets "maxillaries" as a misprint for premaxillaries. The nasal bones are so attenuated, however, that it would not be surprising if specimens were found in which the second anterior elements actually met in the median line, hiding the nasals for a short distance. The length of the maxillo-nasal suture, which is fairly straight, is about equal to the maximum breadth of the maxillæ at the posterior end of the dental arcade. The suture with the lachrymal is less than half the length of that with the jugal or malar. In transverse section the maxillæ are very convex, and, except in the posterior region, the lateral borders are prominently notched for the accommodation of the mandibular teeth.

Nasals.—These are the most attenuated bones of the skull, the maximum length being about ten times the greatest breadth. Examination of a partially disarticulated skull shows that the anterior fifth, or so, of the nasals may be prolonged beneath the premaxillaries, and it seems probable that the extreme points always reach the external nares. On the surface the acuminate anterior processes separate the posterior branches of the premaxillæ. Posteriorly the nasals are divided by the frontal process. The relative proportions of the sutures with the lachrymals and with the prefrontals vary somewhat in the four crania examined, but the areas of contact are about equal. The nasals attain their maximum breadth opposite the anterior ends of the lachrymals.

Lachrymals.—These bones are broader and longer than the prefrontals; anteriorly they appear to broaden with age, and the inner and lateral borders are parallel in the prefrontal region. The suture with the prefrontal is about two and a-half times as long as that with the nasal. The suture with the jugal is about equal to the length of the orbit. On the postero-internal border near the ventral surface there is a large single opening for the lachrymal duct. The orbital border is not prominently raised.

Prefrontals.—These bones are sub-triangular, but the frontal border is curved inwards and the anterior processes are wedged between the nasals and lachrymals. The suture with the nasal is about half the length of that with the frontal. The anterior border of the orbit is formed by the prefrontal and lachrymal in about equal proportions.

Frontal.—The length of this bone is slightly greater than the breadth of the cranial table, about half being formed by the acuminate anterior process, which divides the nasals for a short distance. The widest portion is just posterior to the suture with the postfrontals. The posterior border is curved backwards. From the beginning of the suture with the prefrontals the bone is sharply curved inwards to the anterior process. The portion between the orbits is very concave in immature skulls, but flattens with age. The orbital border is not ridged as in *C. porosus*.

Orbits.—In young specimens the transverse diameter of the orbit is greater than that of the frontal, but in mature and aged examples these proportions are reversed. Each cavity is much larger than the infratemporal vacuity and tends to become more oval with age.

Cranial Table.—The supraoccipital, parietal, squamosals, postfrontals, and the posterior portion of the frontal form a flat cranial table, but the anterior elements are elevated to form the raised border of the orbits. The plane of this table is parallel with that of the dental arcade. The lateral borders slightly converge anteriorly and the posterior border is a double curve. The interorbital region is concave, especially in half-grown specimens. The pits in this area are deeper than elsewhere.

The supratemporal fenestræ are oval cavities, with obliquely sloping internal borders. The transverse diameter of each is about equal to the interorbital space. The parietal contributes the internal moiety, whilst the squamosal section exceeds that of the postfrontal. The junction of the parietal, frontal, and postfrontal sutures is about midway between the cavity and the orbits.

The ratios of the breadth of the cranial table and that of the cranium across the quadrato-jugals in juvenile and old specimens are similar to those recorded by C. C. Mook for *Crocodylus americanus* (loc. cit., p. 59). In our juvenile specimen 295 mm. in length, the breadth of the cranial table is almost equal to that of the cranium, being 18 mm. as compared with 22 mm. In our largest skull, 398 in length, the breadth of the cranial table, taken across the centres of the fenestræ, is 87 mm., whereas the maximum at the quadrato-jugals is 198.

Jugals.—The zygomatic bones are only exceeded in length by the maxilla and nasals, and even in the oldest specimen the vertical depth is contained over four times in the length. The portion in front of the postorbital process is about equal to that behind, which reaches almost to the region of the articular facets of the quadrate.

Quadratojugals.—The anterior processes of these bones are acutely pointed and extend about half way across the infratemporal fenestræ. The area of contact with the quadrate is much greater than that with the jugal. The lateral borders converge somewhat anteriorly.

Quadrates.—There are no special characters associated with these bones.

In the development of the skull the maximum breadth across the quadratojugals is always less than half the length from the tip of the snout to the supraoccipital, as may be seen from the following figures:—

	Total length of specimens.	Cranial length.	Cranial breadth.
<i>J. 4279</i> Juvenile	295	47	22
<i>J. 4283</i> Juvenile	740	127	52
<i>J. 4280</i> Skull only .. ..	..	262	105
<i>J. 2788</i> Skin and Skull ..	2,343	375	165
<i>J. 4286</i> Skull only, aged ..	..	398	198

The development of the slender snout and the change in contours with age may be shown by comparing the length, taken from the tip of the premaxillaries to the anterior border of the orbits, with the maximum breadth of the maxillaries taken below this orbital border.

					Pre-orbital length.	Breadth of Maxillæ.
<i>J. 4279</i>	..	..	..	..	24	14
<i>J. 4283</i>	..	..	..	..	82	31
<i>J. 4280</i>	..	..	..	..	194	64
<i>J. 2788</i>	..	..	..	..	280	102
<i>J. 4286</i>	..	..	..	..	285	129

It will be seen that the juvenile specimen (*J. 4279*) is relatively short-snouted; that in the medium-sized skull the length of the snout may be thrice the breadth of the maxillaries at this point; and that the aged skulls are again less slender. The variability of the snout is illustrated by the proportions of the two large skulls, *J. 2788* and *4286*, the latter being relatively much broader at the orbits.

Palatal Surface.—The anterior portion of the premaxillaries is very irregular owing to the perforations for the accommodation of the two anterior mandibular teeth and the sloping cavities behind. The premaxillary foramen is an irregular triangular cavity, about as large as an alveolus of an average tooth, behind which the conjoined elements have a suture which is at least four times as long as that in front of the foramen. The suture between the premaxillæ and maxillæ passes obliquely backward from the centre of the large notches, but only extends to the second maxillary tooth at the median junction.

The maxillaries form the greater part of the palate. From the posterior end at a point nearly opposite from the pterygoid-palatine suture, the dental arcade converges markedly to the region of the seventh maxillary teeth, but from thence forward the snout becomes very gradually more slender until the enlarged notches are reached. The proportions of the palate vary so much with age that no exact ratios can be applied to both juvenile and aged skulls, but the central breadth of the conjoined elements is contained at least thrice in the maximum length, and may be five times. In antero-posterior profile the maxillæ are decidedly convex, but in one skull, probably as the result of injury, the anterior region is very concave. In transverse section the palate is fairly flat, but the alveolar borders are irregularly raised. The median line is marked by ridges in the anterior region and there may be a depression posteriorly. A lengthy suture is formed with the anterior process of the palatines and a much shorter one marks the lateral extension of each palatine to the front edge of the fenestra.

The palatines contribute about one-third of the total length of the bony palate. The breadth is equal to the maximum transverse diameter of the adjoining fenestra, and in the smaller crania this area is very flat in transverse section, but in the large skull the lateral borders are broadly rounded. In antero-posterior profile these bones are concave. The anterior processes are elongate and acuminate, and are almost as long as the main portion. The lateral portions of the suture with the pterygoids are curved backwards.

The greater part of each palatine fenestra is contained within the area of the dental arcade, and, except in aged skulls, the breadth is contained at least three times in the length. The fenestræ extend as far forward as the anterior borders of the eleventh maxillary teeth.

Pterygoids.—The palatal plates of the pterygoids are concave, both transversely and in antero-posterior direction. The maximum length of each element is greater than the breadth and is equal to that of the palatine without its anterior processes. They contribute the posterior border to the palatine fenestræ. The internal narial aperture is large and sub-quadrangular and opens downwards and backwards. Its posterior border, which is divided by a prominent median wedge, forms the termination of the bony palate below the opening of the median Eustachian canal.¹ The inferior portion of the median ridge of the vertically placed basioccipital is seen in this aspect.

Basisphenoid.—The basisphenoid may not appear in this region, although it is sometimes represented by an attenuated wedge. We may thus have *the pterygoids actually articulating with the basioccipital on the surface*, although separated above.

The transpalatines or ectopterygoids have a longer contact with the maxillaries than with the jugals or with the pterygoid plates. These bones present no special characteristics.

Dentition.—Although the usual number of teeth in the upper jaw is nineteen on each side, with fifteen in the lower, there may be as many as twenty-one above and seventeen below.

There are the usual five teeth in each premaxillary, the fourth being the largest and the third only slightly less. The first is set near the median line and is closely paired with its fellow. After a space the second and third are set close together and an interval separates the fourth and fifth. The teeth in the maxillary vary from fourteen to sixteen. The fifth tends to be the most robust of the series, and this is slightly larger than the fourth mandibular. The posterior teeth in both jaws are considerably stouter and somewhat shorter than the anterior. The apices of the first seven teeth are accommodated in lateral notches in the mandible.

The first pair of mandibular teeth perforate the premaxillaries and their apices may be seen on the upper surface of the snout. The fourth tooth is raised somewhat above its fellows. There may be as many as seventeen in the series, and the second to the tenth, inclusive, are accommodated in notches in the maxillaries when the jaws are closed. The posterior teeth range inside the maxillary series.

Two of our specimens have twenty-one upper and two (including *J. 4279*, juvenile) have twenty, whilst four of the mandibles have more than fifteen teeth.

Double Teeth.—A remarkable feature is the appearance in several specimens of double-functioning teeth in either the maxillaries or the mandible

¹ Owen, Phil. Trans. Roy. Soc., 1850, p. 521.